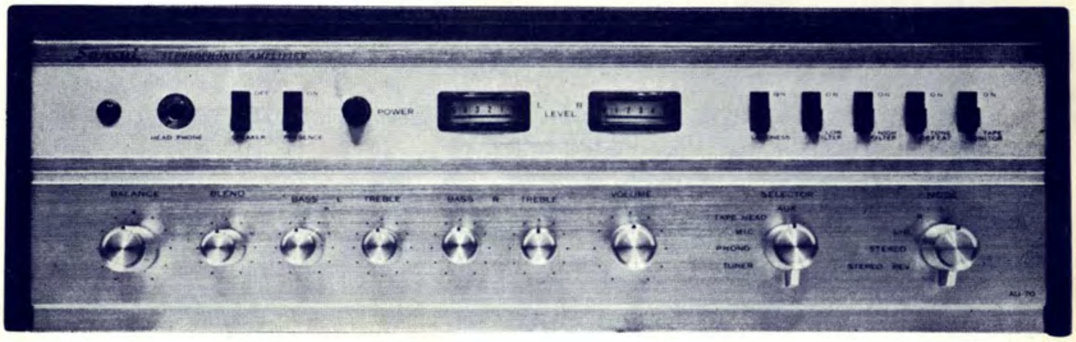
OPERATING INSTRUCTIONS & SERVICE MANUAL

STEREO CONTROL AMPLIFIER

SANSUI AU-70



SANSUI ELECTRIC COMPANY LIMITED

This amplifier has a maximum output of 50 watts (25W-25W) and features an amazingly low distortion factor of not more than 0.15% at 20W. A high-quality amplifier with many exciting features, it is delivered to you with Sansui's fullest confidence. This booklet explains the steps necessary for operating and caring for your new the AU-70. Read all the instructions carefully and retain for future use.

CONTENTS

FEATURES 3, 4
SPECIFICATIONS 5
CHARACTERISTICS 6
CONNECTIONS 7, 8, 9, 10
SWITCHES AND CONTROLS 11, 12
OPERATIONS 13, 14
HINTS ON USE 15, 16
SERVICE NOTE 17, 18
PARTS LIST 19, 20, 21
SCHEMATIC DIAGRAM 22
PARTS LAYOUT 23

SANSUI

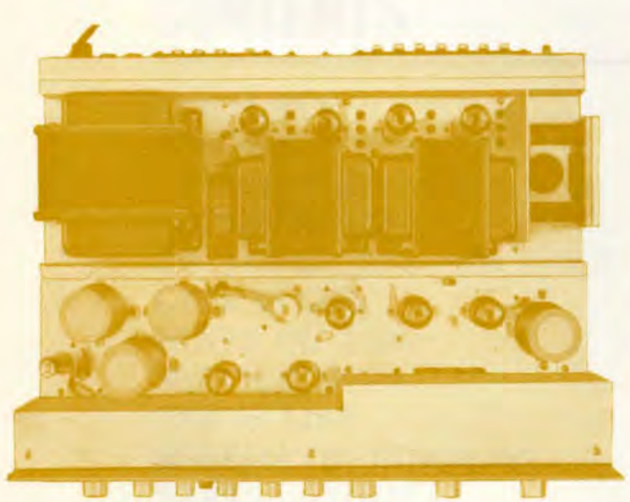
STEREO CONTROL AMPLIFIER

AU-70

FEATURES

7189A P.P. PRODUCES 40W WITHOUT DISTORTION (MAX. 0.95% AT 30 CPS AND 0.15% AT 1,000 CPS)

The 7189A power tubes operate in class AB_1P.P. (fixed bias) for high-fidelity reproduction. Their combined maximum output is limited to 50 W. The amplifier incorporates a multiplex feedback circuit (total negative feedback: 26 dB) for the first time in this class of amplifiers in Japan. This makes it extremely low in distortion over the whole frequency range. Total harmonic distortion at 1 kc is 0.15%. At 30 cps, a very low frequency at which it is extremely difficult to minimize harmonic distortion, the distortion is limited to not more than 0.95%. This is quite a feat for a 50-watt amplifier. Another remarkable feature is the damping factor of 18, a figure which is lower than that of triode power tubes coupled in P.P. This is why bass sounds come out with such clarity.



NFB USED IN ALL AMPLIFIER CIRCUITS, FROM PREAMP TO POWER AMPLIFIER

The low distortion of the power amplifier is meaningless if the preamplifier generates distortions. Your AU-70 uses a three-stage amplifier circuit in its intermediate or control amplifier—unlike conventional one-stage control amplifiers—and has all its circuits in a single negative-feedback loop. These make your AU-70 free from noise and distortion.

SUPER-PRECISION TRANSISTOR PREAMPLIFIER ELIMINATES HUM AND NOISE

The exclusive Sansui four-transistor preamplifier, which features a transistor circuit factor of 4—as compared with conventional 5-10—and a transistor noise factor of 2 dB—as compared with conventional 5 dB, eliminates hum and noise, the enemy of high-fidelity reproduction. The amplifier has a much better S/N ratio and a gain three times larger than vacuum-tube amplifiers.

EACH CHANNEL CAN BE OPERATED INDEPENDENTLY EQUIPPED WITH TONE DEFEAT

Each channel has independent tone controls for bass and treble. This makes fine adjustment possible. Moreover, each channel is equipped with tone defeat which cancels the tone control circuits. You can easily obtain a flat frequency response without causing any undulation in response or reduced gain in bass and treble as in the case of conventional mechanical control by means of a tone volume knob. Therefore, you can get an accurate, perfectly flat response from your AU-70 just by flipping a switch.



BLEND CIRCUIT PERMIT CONTINUOUS SHIFT FROM MONAURAL TO STEREO

As you turn the "BLEND" switch clockwise, your AU-70 gradually shifts from monaural to stereophonic reproduction. This feature enables you to get full stereophonic effect by compensating program sources which give a particularly strong effect of the concert hall.





EASY-TO-READ THREE-RANGE OUTPUT LEVEL METERS

Each output level meter can be switched over to any of the three scales of 5, 10 and 25 watts. The meters not only give direct readings of both channels, but also indicate any lack of balance between the right and left outputs. These prove very useful in balancing the outputs.

THREE-DIMENSIONAL PERFORMANCE POSSIBLE WITH CENTER-CHANNEL OUTPUT TERMINAL

Your AU-70 has an output terminal for the center-channel amplifier. Connect it to your monaural amplifier to produce a three-dimensional effect.

EQUIPPED WITH ADVANCED, HIGH-PERFORMANCE ACCESSORY CIRCUITS

Your AU-70 is equipped with various advanced accessory circuits such as loudness control, low and high filters, tape monitor, tone defeat, presence, blend, speaker switch and headphone jack.

SPECIFICATIONS

MAIN AMPLIFIER:

MAXIMUM OUTPUT: 25W-25W (50W total)

HARMONIC DISTORTION:
Max. 0.15% at 20W for 1,000 Hz
Max. 0.95% at 20W for 30 Hz

INTERMODULATION DISTORTION: Max. 0.85% at 20W, (50 Hz +5,500 Hz)

FREQUENCY RESPONSE: 10-80,000 Hz at ±1 dB

OUTPUT IMPEDANCE: 8 and 16 ohms

GAIN AND SENSITIVITY:

PHONO: MAG 84 dB (Output 20W at 1.1mV input)
X-TAL 54 dB (Output 20W at 36mV input)

TAPE: 86 dB (Output 20W at 0.9mV input)

MIC: 86 dB (Output 20W at 0.9mV input)

AUX: (TAPE MON) 51 dB (Output 20W at 50mV input)

TUNER: 51 dB (Output 20W at 50mV input)

RESIDUAL NOISE: below 0.25 μW

S/N RATIO 52 dB (at TAPE terminal)

TONE CONTROL: Type CR
50 Hz +11 to −15 dB
10,000 Hz +12 to −13 dB

EQUALIZER: Type NF

TAPE: NARTB (50μs)

PHONO: RIAA

ACCESSORY CIRCUITS:

PRESENCE CONTROL: Turnover at 150 Hz

LOW FILTER: 50 Hz −12.5 dB

HIGH FILTER: 10,000 Hz −13.5 dB

LOUDNESS CONTROL

TONE DEFEAT

TAPE MONITOR

HEADPHONE JACK

TAPE RECORDER PLAYBACK CONNECTION (DIN)

TERMINAL FOR CENTER-CHANNEL AMPLIFIER

LEVEL METER (FOR OUTPUT) Three ranges of 5, 10 and 25W

BLEND CONTROL

VACUUM TUBES, TRANSISTORS AND DIODES:
7189A×4, 6AN8×2, 12AX7×3, OA-91 germanium diode×2, 2SB-381 transistor×4, SD-1B silicon diode ×2 SW-0503 silicon diode×1
TOTAL: 9 tubes and 9 diodes

POWER SUPPLY: 117V AC, 50 and 60 Hz

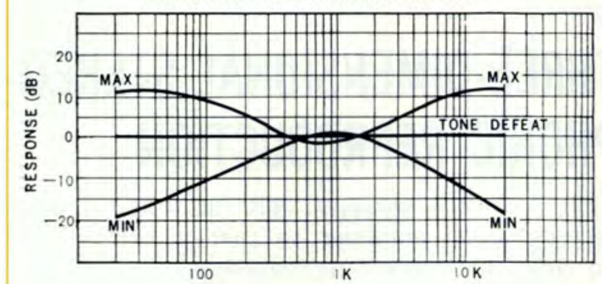
POWER CONSUMPTION: 150VA

DIMENSIONS: Width 15 11/64". Depth 12 19/32". Height 5 19/32".

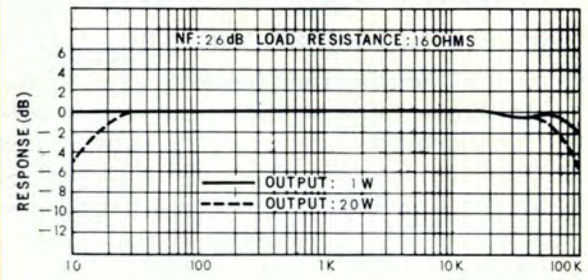
WEIGHT: 30 lbs

CHARACTERISTICS

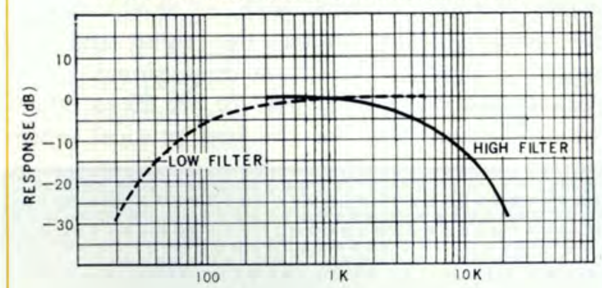
TONE CONTROL CHARACTERITICS



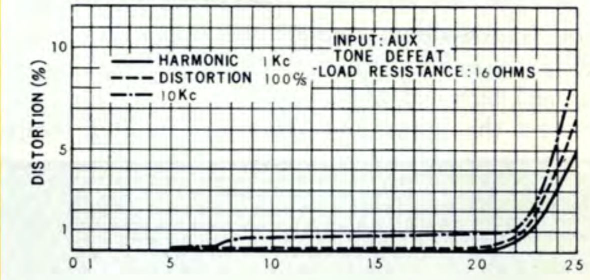
FREQUENCY RESPONSE CHARACTERISTICS



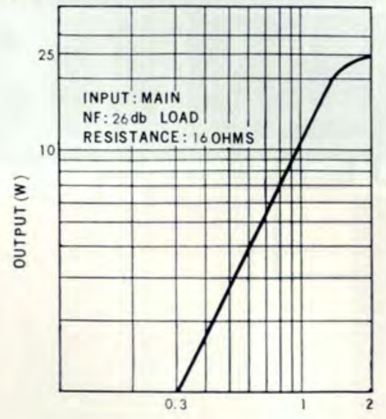
HIGH AND LOW FILTER CHARACTERISTICS



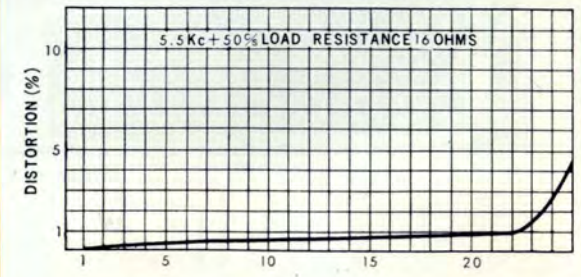
HARMONIC DISTORTION



INPUT AND OUTPUT CHARACTERISTICS



INTER MODULATION DISTORTION



CONNECTIONS

SPEAKER

STEREOPHONIC REPRODUCTION

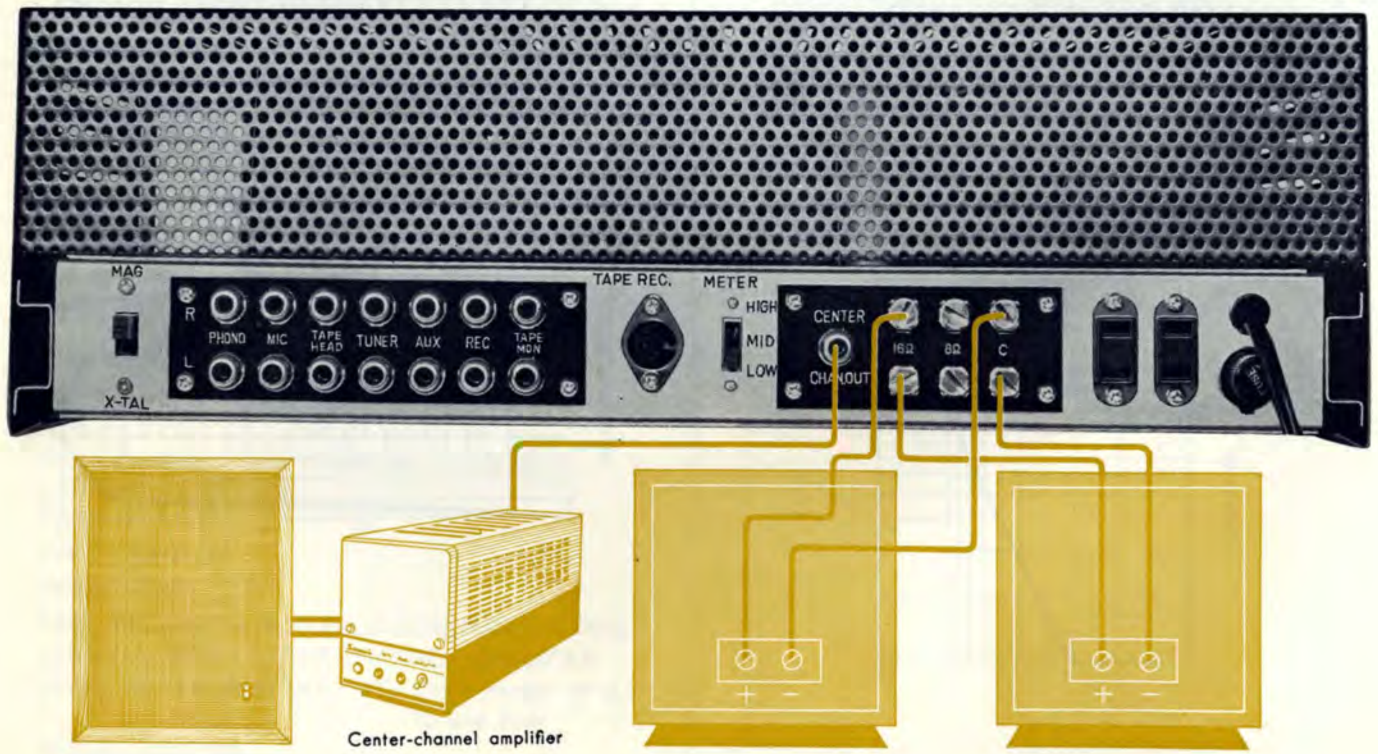
Connect (+) of the right-hand speaker to the 8- or 16-ohm terminal of the upper R terminals on the back of the amplifier. Connect (−) of the right-hand speaker to (C) of the upper R terminals. Connect (+) of the left-hand speaker to the 8- or 16-ohm terminal of the lower L terminals on the back of the amplifier. Connect (−) of the left-hand speaker to (C) of the lower L terminals.

MONAURAL REPRODUCTION

When you use an 8-ohm speaker system for monaural reproduction, connect the upper and lower 16-ohm speaker terminals of your amplifier to the (+) terminal of the speaker.
Connect the upper and lower (C) speaker terminals of your amplifier to the (−) terminal of the speaker.

THREE-DIMENSIONAL STEREOPHONIC REPRODUCTION

Your AU-70 is equipped with a terminal for a center-channel amplifier so that it can be used for three-dimensional reproduction.
To do this, connect the input terminal of a monaural amplifier (Either a main or combination amplifier can be used) to the pin-jack of the center-channel output terminal at the left of the speaker terminal board with a shielded wire The center-channel mixes the right and left sounds to produce the three-dimensional effect.
Speakers suitable for the AU-70 are 20 to 30-cm coaxial speakers and, for the best musical reproduction, two or three-way speaker systems which use different speakers for different frequency ranges.
In choosing the cabinet, take account of tonal quality in addition to design.
CAUTION:
If you find that the sounds from both speakers do not mix well, but leave a sort of vacuum midway between the speakers, you can conclude that the amplifier and the speakers do not match in polarity (phase). In such a case, reverse the (+) and (−) connections of either speaker.
When you use two pairs of speakers for stereophonic reproduction, make sure that the speaker output terminal connections do not cause contact between R and L and that the terminals are connected properly. If the connections are faulty, your amplifier will not work normally and may also go out of order.

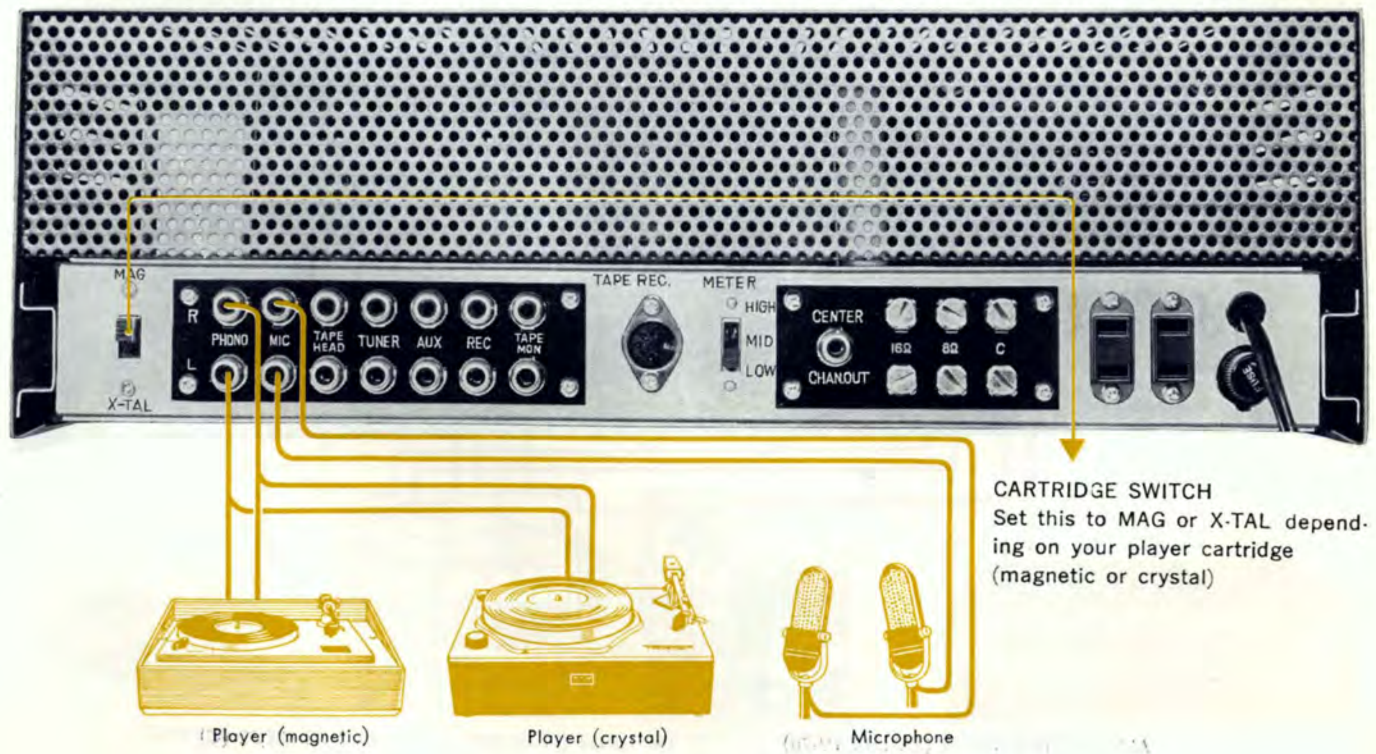


RECORD PLAYER

1. Connect the output terminals to the "PHONO-R" and "PHONO-L" terminals (in the case of monaural reproduction, to either of these terminals) on the back of your amplifier with shielded wires.
2. Set the cartridge switch on the back of your amplifier to "MAG" or "X-TAL" according to the type of your cartridge.
3. Connect the power-cord plug of the player to the power plug receptacle on the back of your amplifier.

MICROPHONE

Connect the microphone to R or L of the "MIC" terminals on the back of your amplifier. When you use two microphones, connect one to R and the other to L.



CONNECTIONS

TUNER

You can listen to broadcasts easily by connecting your amplifier to a tuner and MPX adaptor.

A) STEREO TUNER

Connect tuner output to the R and L "TUNER" terminals on the back of your amplifier.

B) MONAURAL TUNER

Connect tuner output to either R or L of the "TUNER" terminals on the back of your amplifier.

C) FM MONAURAL TUNER AND FM-MPX ADAPTOR.

Connect monaural tuner output to the input terminal of the FM-MPX adaptor and connect R and L of the adaptor output terminals to R and L, respectively, of the "AUX" terminals on the back of your amplifier.

TAPE RECORDER

1. SINGLE-CONNECTION TAPE RECORDER (DIN STANDARD SPECIFICATION):

Connect the single-connection connector to the "TAPE-REC" receptacle on the back of your amplifier.

2. PIN-JACK TAPE RECORDER

a) Recording

Connect the tape recorder input terminals to R and L (R or L in the case of monaural operation) of the "REC" terminals on the back of your amplifier with shielded wires.

b) Playback

Connect the tape recorder output terminal ("LINE") to R and L (R or L in the case of monaural operation) of the "TAPE MON" terminals on the back of your amplifier.

3. Playing tapes on the tape deck

Connect the tape deck output terminals to R and L (R or L in the case of monaural operation) of the "TAPE HEAD" terminals on the back of your amplifier.

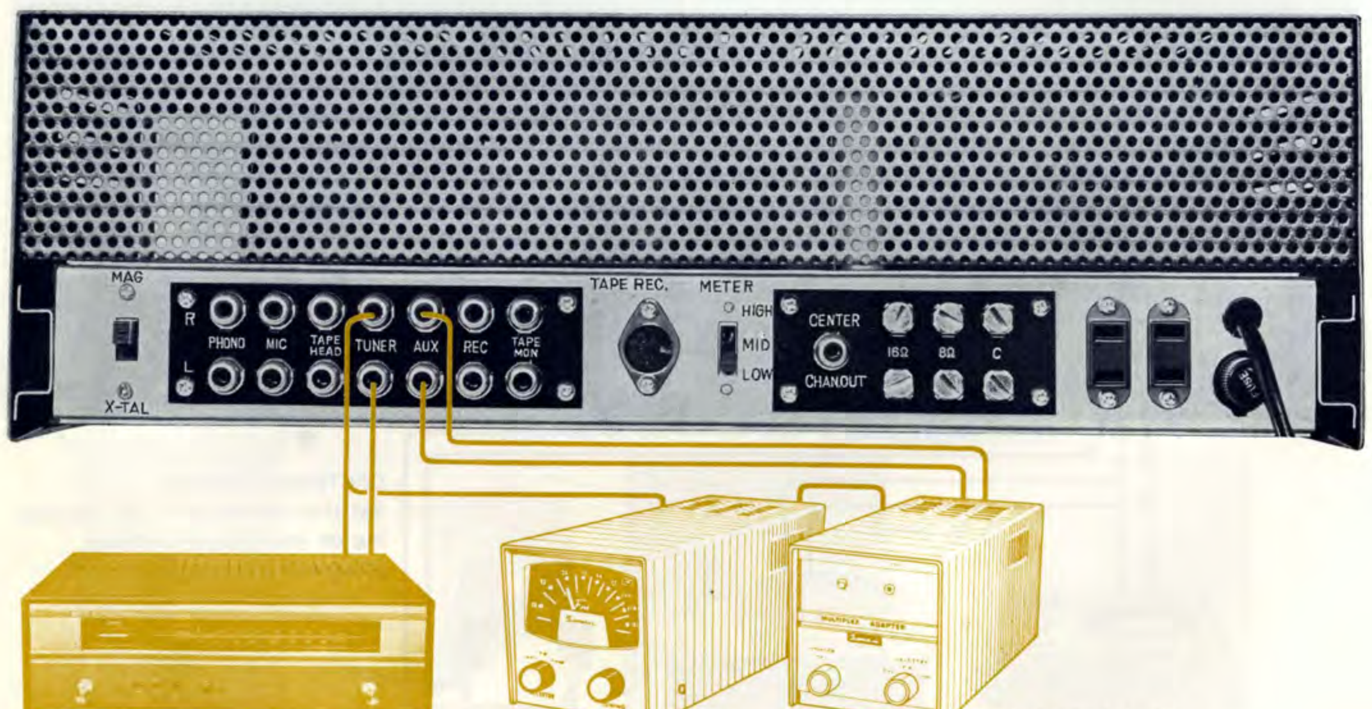
4. Monitoring with a three-head tape recorder

a) Single-connection tape recorder

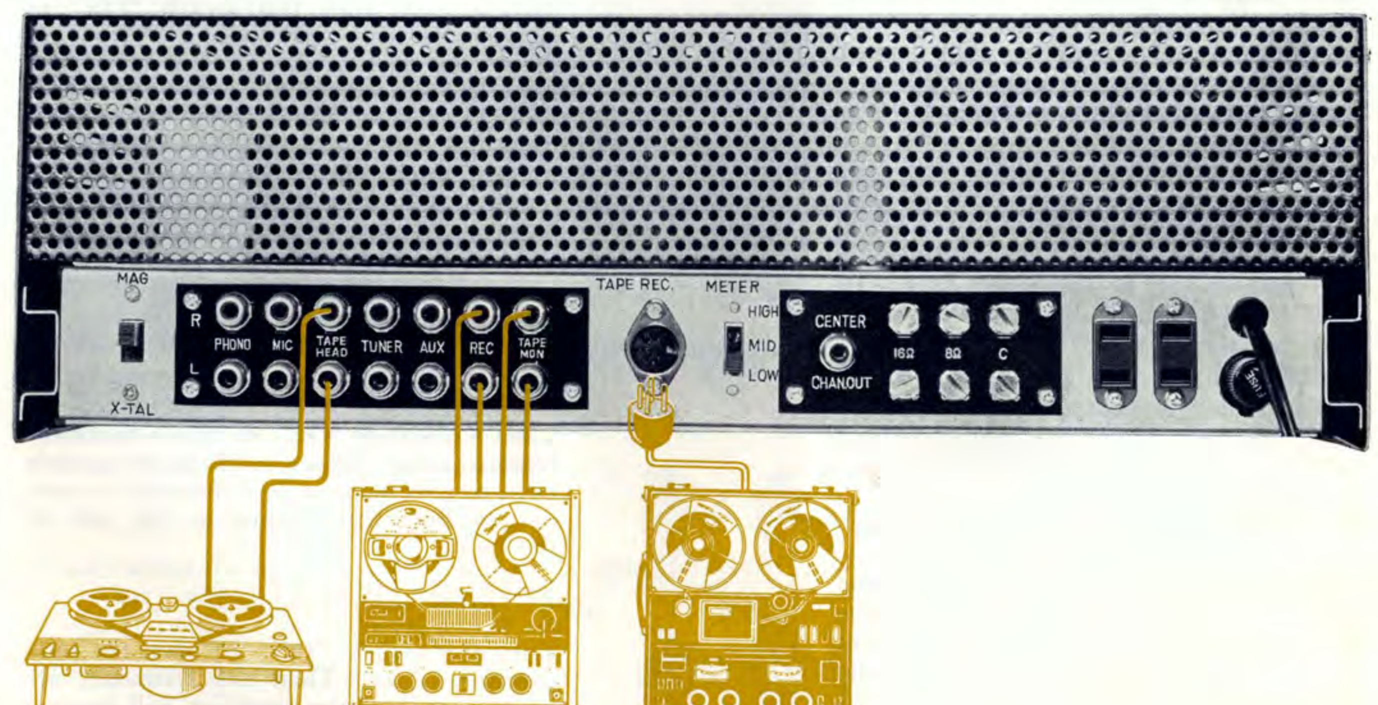
Connect the single-connection plug to the "TAPE-REC" receptacle on the back of your amplifier.

b) Pin-jack tape recorder

Connect the tape recorder input terminals to R and L (R or L in the case of monaural operation) of the "REC" terminals on the back of your amplifier. Also, connect the tape recorder output terminal "LINE" to R and L (R or L in the case of monaural operation) of the "TAPE MON" terminals on the back of your amplifier.



AM/FM/MPX TUNER (SANSUI TU-70) FM TUNER (B) or (C) MPX ADAPTOR (C)



Tape-deck Tape recorder Tape recorder (DIN)

SWITCHES AND CONTROLS

① POWER INDICATOR

This lights up when power is being supplied. It remains on while the amplifier is in operation.

② HEADPHONE JACK

When you want to avoid disturbing others or when you use the amplifier as a monitor, connect headphones to this jack. You can still enjoy stereophonic reproduction through the headphones. For this purpose, you can use any type of headphones or earphones if its plug fits into the jack. But use dynamic headphones designed for stereophonic reproduction, if possible.

③ SPEAKER (SPEAKER OFF)

When you use headphones with the headphone jack, set this switch to "OFF" to cut off sound to the speakers. This feature enables you to enjoy stereophonic reproduction without disturbing others.

④ PRESENCE

If the Tone Control alone is used for bass compensation, slightly higher frequencies are compensated at the same time. To avoid this, turn this switch "ON". This sets the turnover at 150 cps, changing speaker damping and frequency response characteristics to compensate bass. As a result, all sounds become impressive and you can enjoy clear, magnificent bass.

⑤ POWER

This switch is used for connecting and disconnecting the power supply. Push the button for power. Push it again to shut it off. The switch also activates and deactivates the power-supply plug receptacles on the back of the amplifier.



⑥ OUTPUT LEVEL METERS

The right and left meters indicate the output levels of the right and left speakers, respectively.
Since output is shown separately for each channel, the meters provide easy balance adjustment. Besides, you can watch changes in the output of each channel during operation. Each meter can be set to any of the three ranges of 5, 10 and 25 watts by means of the output-level meter switch on the back of the amplifier. Choose the appropriate range according to the output you want. When the "MODE" switch is set to R (or L), the meter for L (or R) does not work.

⑦ LOUDNESS

When sound volume is at a low level, you feel as if bass and treble are missing. In such a case, turn this switch "ON" to compensate bass and treble. This will make you feel as if you were present at an actual concert.

⑧ LOW FILTER (for eliminating low-frequency noise)

Turn this switch "ON" to reduce phonomotor and other unpleasant low-frequency noises.

⑨ HIGH FILTER (for eliminating high-frequency noise)

Turn this switch "ON" to reduce relatively high-frequency noise, such as the scratch from records made of poor material or noise due to fluorescent lamps in the case of the tuner.

⑩ TONE DEFEAT

Turn this switch "ON" to open the tone control circuits. Then the frequency response curve of the amplifier will become perfectly flat.



⑪ TAPE MONITOR

When you make recordings with a three-head tape recorder, turn this switch "ON" to use the amplifier as a monitor. Then the sounds recorded on the tape are reproduced while you are recording. Keep this switch "ON" when you play the tape on the tape recorder.
Be sure to keep the switch "OFF" otherwise.

⑫ BALANCE

This knob is used to adjust the balance of volume between the right and left speakers for the best stereophonic effect. Make the adjustment while watching the output level meters and listening to the sounds of both speakers. When the amplifier is adjusted properly, you feel as if the sound comes from a point midway between the two speakers.

⑬ BLEND

This knob permits continuous shift from stereophonic to monaural reproduction. Turn it counter-clockwise to bring reproduction closer to monaural (R+L). For complete monaural reproduction, turn it as far counter-clockwise as possible.
The sounds of the right and left speakers become separated when you turn the knob clockwise (R and L perform their respective functions). The best stereophonic effect is obtained when you turn it as far as possible.

⑭ BASS and ⑮ TREBLE for L

These control the tone of the left speaker.

⑯ BASS and ⑰ TREBLE for R

These control the tone of the right speaker.



⑱ VOLUME

This knob is used to control the volume of the tuner, records and tapes. Turn it clockwise for louder reproduction. To reduce the volume, turn counter-clockwise.

⑲ SELECTOR (input-selector)

TUNER: For receiving broadcasts through the tuner.
PHONO: For playing records.
MIC: For using a microphone.
TAPE HEAD: For playing tapes on the tape deck (directly from the tape head).
AUX: For reproducing voice input or using the MPX adaptor.

⑳ MODE (Stereophonic/ monaural switch)

This switch is used to shift from stereophonic to monaural reproduction or vice versa.
STEREO: Set the switch at this position for stereo reproduction. Signals fed into A come out of A's speaker and those fed into B come out of B's speaker.
STEREO-REV: This position, too, is for stereo reproduction. But signals fed into A come out of B's speaker and those fed into B come out of A's speaker. Choose this position when the right and left are reversed in reproduction.
L+R: Signals fed into L and R are blended into one (L+R) in the amplifier before they come out separately from L and R. Signals fed into A and B become A+B in the amplifier and come out of the speakers of A and B in the form of the combined sound A+B.
R (Mono R): Signals fed into A come out of A's and B's speakers. Use this position for reproducing mono broadcasts and tapes.
L (Mono L): Signals fed into B come out of A's and B's speakers.
This position is rarely used.

OPERATIONS





RECORD PLAYING

1. Set the "SELECTOR" switch at "PHONO".
2. Set the "MODE" switch at "STEREO" or "STEREO-REV" (at R or L in case of monaural operation).
3. Switch on the player, put on a record and adjust the number of revolutions as necessary before placing the pickup on the record.
4. Balance the sounds from both speakers by means of the "BALANCE" knob while watching the output level meters.
5. Adjust the amount of sound by means of the "VOLUME" knob. Other adjusting knobs and switches can be used to get the most satisfactory repreduction.

When you play a monaural record on a stereo record player, follow the same procedure as for stereo records. This will give you better results.

Catridges are either magnetic or crystal. Both can be used with the AU-70, but, if possible, use a magnetic type for the highest fidelity. If you feel that right and left are reversed when playing a stereo record, turn the "MODE" switch to "STEREO-REV". To balance the sounds from both speakers, play a monaural record in the same way as a stereo record and adjust the "BALANCE" switch in such a way that you feel that the sound comes from a point midway between the right and left speakers. In this case, you can count on the output level meters for a rough determination of the balance. Also, make sure that the "BLEND" knob is kept at the point where it cannot be turned clockwise any further.

When you supply power to the player from the power-plug receptacle on the back of your amplifier, do not forget that the player is switched off when you switch off the amplifier.

BROADCASTS

In the case of A and B above:

1. Set the "SELECTOR" switch at "TUNER".
2. Set the "MODE" switch at "STEREO" or "STEREO-REV" in the case of A and at R or L (according to the channel selected) in the case of B.
3. Tune in with the tuner.
4. Use other adjusting knobs and switches to get the most satisfactory performance.

In the case of C

1. Set the "SELECTOR" switch at "AUX"
2. Set the "MODE" switch at "STEREO" or "STEREO-REV".
3. Tune in with the tuner.
4. Prepare the FM-MPX adaptor for stereophonic reception.
5. Use other adjusting knobs and switches to get the most satisfactory performance.

When you use a tuner or FM-MPX receiver, read the instructions for them carefully. There should be no mistakes in connections and operation.

When you use our TU-70, follow the instructions for A. When you use an FM-tuner (without Multiplex) and MP-2, follow the instructions for C.

USE A MICROPHONE

You can use microphones with your AU-70 amplifier. Any high-impedance (50 kilo-ohm) crystal, dynamic or velocity microphone is acceptable.

1. Set the "SELECTOR" switch at "MIC".
2. Set the "MODE" switch at "STEREO" (when you use only one microphone for stereophonic effect)
   at R (when you use only one microphone for monaural reproduction),
   or at L+R (when you mix two different program sources from two microphones.)
3. During stereophonic operation, you can use the "BLEND" knob for mixing purposes.
4. Other adjusting knobs and switches can be used for the most satisfactory reproduction. Remember that your AU-70 accepts only high-impedance microphones. You cannot get the best performance if you use too long microphone cord, which causes various problems and reduces treble.

   Your amplifier has separate tone controls for right and left speakers. You will find this feature very useful when you use one microphone for music and another for voice. Furthermore, it gives added versatility to your amplifier, particularly when you record on tape what is picked up by microphones.

RECORD AND PLAY TAPES

Your AU-70 can be used with a tape recorder for recording and playback and can also play tapes on the tape deck. If you use a three-head tape recorder which has separate record and playback heads, you can make recordings while listening to a reproduction of the recordings. In other words, your amplifier can be used as a monitor which lets you know the quality of your recordings while they are being made.

RECORDING

1. Set the "SELECTOR" switch at the proper position according to the program source (broadcast or record) you are going to record.
2. Set "MODE" switch at "STEREO" (for stereophonic recording), at R or L (for monaural recording), or at L+R (for monaural recording of a stereophonic source).
3. Prepare the tape recorder for recording.
4. Operate the recorder and amplifier adjusting knobs and switches properly.

Amplifier adjusting knobs do not affect the level and tonal quality of recordings, but only control those of the sound from the speakers. When you record a broadcast or record, you can obtain better results by connecting the tape recorder directly to your amplifier instead of picking up the sound from the speakers with microphones.

PLAYBACK

1. a) Tape deck
   Set the "SELECTOR" switch at "TAPE".
   b) Tape recorder
   Set the "TAPE MONITOR" switch at "ON".
2. Set the tape recorder in the play position.
3. Other adjusting knobs and switches can be used for the most satisfactory reproduction.

CAUTION

When you use a Tape Recorder, keeping the "TAPE MONITOR" switch at "ON" the "MODE" switch is not operative.

If you want to use the "MODE" switch, connect the recorder output to the "AUX" pin-jacks on the back of your amplifier and the "TAPE MONITOR" switch at off.

TAPE MONITORING

To use your amplifier as a monitor for a three-head tape recorder, follow the same procedure as the one for playing tapes on a recorder. When you use a recorder, read the instruction manual carefully to avoid errors in connection and operation.

Unless you use your amplifier as a tape monitor or for playing a tape with a tape recorder, be sure to switch off the "TAPE MONITOR" switch.

Connecting a tape recorder can be done by using either a single-connection connector or by pin-jacks. The single-connection plug conforms with German DIN standard specifications. It makes it easier to connect the tape recorder to your amplifier because it has a five-pin plug for both record and playback. When you use your amplifier as a tape monitor, turn on the "TAPE MONITOR" switch if you want to hear the sound you are recording.

HINTS ON USE

Fig. 1



SPEAKER POLALITY

If the phase (polarity, viz. +and−) of the right and left speakers is not correct, sounds at the center of the frequency range become weak. You will particularly sense an attenuation of bass. To make sure that speaker polarity is all right, play a monaural record on a stereo record player. If the polarity is reversed you will have the result mentioned above. In such a case, reverse the polarity of either speaker. (Connect the − lead-wire to+.) When both speakers are thus made to agree in polarity, you will feel as if the sound comes out of a single speaker placed midway between the right and left speakers.

FUSE

The amplifier does not work when the fuse is blown. In such a case, disconnect the power cord and replace the fuse on the back of the amplifier. Use a 3-ampere fuse encased in a glass tube. Never risk the danger of using fine wire or a fuse of a larger capacity as a substitute. If the fuse has burnt out because the amplifier is out of order, locate the trouble and repair it before replacing the fuse. The fuse blows if you use an AC plug receptacle larger than the specified capacity (80 VA for two).

HEAT GENERATED BY AMPLIFIER

The top of the amplifier case becomes considerably hot after many hours of continuous operation. But this should not worry you because air vents are provided on the top and back of the case. If you place something on the amplifier or put it in a closed box, or keep its front panel facing up, it might go out of order.

CONNECTIONS

When you connect your amplifier to a tape recorder or tuner, be sure to use an adequately thick shielded wires. If you use untwisted vinyl cord like those used for lights, you will suffer from hum. Furthermore, do not use a wire longer than 2 meters (about 6.5 ft.), because the longer the connecting wire is, the greater the attenuation of treble becomes. For connection to a tuner or FM adaptor, use a wire 1 to 1.5 meters (about 3.3 to 4.8 ft.) long. When you use the amplifier for monaural reproduction, it is easier for operation to use the upper R terminal for connection. Be sure to set the "MODE" switch to the connected channel.

HUM AND HOWLING

When you play a record or tape, you may sometimes hear unpleasant humming or howling. This does not mean that your amplifier is defective. In most cases, humming or howling is a result of these causes:

If you place a record player on or near the speaker box, the vibrations of the speaker cabinet caused by the sound waves from the speaker are transmitted to the player and cause howling. To prevent this, keep the record player away from the speaker cabinet or put a thick cushion between the player and the cabinet.

A low, buzzing sound will also be produced if you do not use shielded wires for connection. If this is not the cause, examine the connections closely. Make sure that the earth and live ends are not reversed so that the motor and arm are inadequately grounded.

Fig. 2

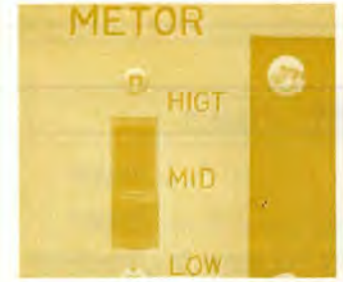
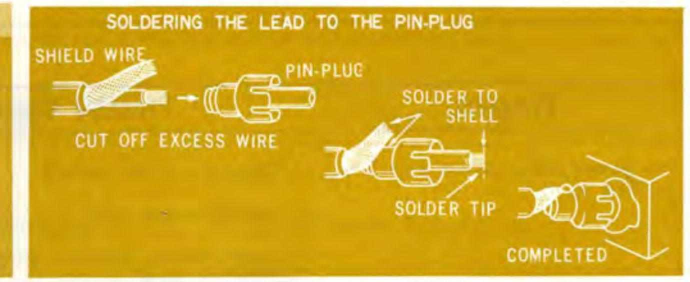


Fig. 3



CONNECT LEADWIRES PROPERLY

Connect leadwires properly to the speaker and other input and output terminals. If connections are loose or touch other parts, your amplifier will not work properly. Moreover, it may produce noise. If you use your amplifier in such a way for a long time, it may eventually break down. Finally, read the instructions for your tuner or tape recorder carefully before you connect it to your amplifier.

LEVEL METER SWITCH

This is used to select the most suitable meter sensitivity from the three ranges of 5, 10 and 25 watts. The variable sensitivity is intended to make it easier to watch needle movement.

high: up to 5 watts
medium: up to 10 watts
low: up to 25 watts (maximum output)

Choose the appropriate range according to volume level you want.

AC OUTLET

The AC outlets on the back panel are connected or disconnected by the power switch on the front panel. The total capacity is 80VA—30VA and another 50VA— Be sure to use them within the limit.

WHERE TO BE PLACED

The amplifier should be installed to the place as given below:

1. Easy to ground;
2. Floor not vibrated;
3. Not wet and dusty;
4. Not exposed to the sun;
5. Well ventilated.

SERVICE NOTE

Symptom	Probable Cause	What to Do
No power when power switch is pushed on	1. Defective power switch.	Replace.
	2. Defective line cord.	Replace.
	3. Loose contact between plug and socket or defective plug.	Recondition or replace.
	4. Blown fuse.	Replace.
		If again blown after replacing, check power transformer (T_1) & path condenser (C_{81}) in power circuit for short-circuit.
Power indicator is lit when power switch is pushed on, but;		
A. the unit does not work at all.	1. Defective tube.	Check $V_1 \sim V_9$ and silicon diodes.
	2. Abnormal voltage in tubes and other parts.	Check voltage in tube and other parts and replace, if necessary. If voltage is OK, check AUX input circuit and hereafter.
B. PNONO and TAPE does not function.	1. Defective head amplifier (transistor section).	Replace transistor head amplifier unit.
	2. Defective selector switch.	Replace or repair S_{2a2b} and/or S_{2e}, S_{2f}
	3. Loose contact or short-circuit between input terminal and pin-jack.	Replace or repair.
	4. Defective record player, tape recorder, or others, connected to the unit.	Replace.
	5. Defective coupling condenser.	Replace C_7 and/or C_8.
C. Weak sound on AUX, PHONO and TAPE.	1. Abnormal voltage in power circuit and other parts.	Check and repair.
A. Normal voltage at every part but weak sound on AUX	1. Defective fixed resistance.	Check $R_{55} \sim R_{58}$, $R_{66} \sim R_{71}$ and Compound part CRSO1, CRSO2.
	2. Short-circuit in output transformer.	Check T_1 and T_2.
	3. Discharged capacitor.	Check $C_{21} \sim C_{24}$, C_{36} and C_{37} tubular electrolytic capacitor C_{25}, C_{26}, C_{40}, C_{41}.
	4. Aged tube.	Check $V_1 \sim V_9$.
	5. Defective slide switch or selector switch.	Replace or repair S_{3a}, S_{3b}, S_{4a}, S_{4b}, $S_{6a} \sim S_{6c}$.
B. Normal voltage at every part but weak sound on PHONO and TAPE.	1. Defective selector switch.	Replace or repair S_{2a}, S_{2b}, S_{2e}, S_{2f}, S_{3a} and S_{3b}.
	2. Abnormal input circuit: loose contact between input terminal and pin-jack; defective shielded wire.	Replace or repair.
	3. Defective record player, tape recorder or others, connected to the unit.	Replace
	4. Defective coupling condenser.	Check C_1, C_2, C_5, C_6, C_7, and C_8.
	5. Discharged bypass condenser.	Check C_3, C_4, C_9, and C_{10}.

Symptom	Probable Cause	What to Do
A. Distorted sound on AUX.	1. Aged tube.	Check $V_1 \sim V_9$.
	2. Short-circuit in output transformer.	Check and repair T_2 and T_3
	3. Defective loudspeaker.	Replace.
	4. Defective record player, adaptor or others, connected to the unit.	Replace
B. Distorted sound on PHONO and TAPE.	1. Defective record player, tape recorder or others, connected to the unit.	Replace.
	2. Defective tubular electrolytic capacitor.	Replace C_1 and/or C_2.
	3. Disconnection at fixed resistance.	Chech $R_{27} \sim R_{32}$, R_4, R_{13}, R_{14}, R_{15}, R_{16}, R_{17}, R_{18}, R_{19}, R_{20}, R_{21} and R_{22}.
A. Hum on AUX.	1. Electrolytic capacitor discharged.	Check C_{35}, $C_{66} \sim C_{73}$, $C_{76} \sim C_{77}$.
	2. Defective tube.	Check $V_1 \sim V_9$.
	3. Defective record player, adaptor or others, connected to the unit.	Replace.
	4. Hum balancer not properly adjusted.	Check VR_{14} and VR_{15}.
	5. Disconnected NF resistor.	Check R_{82} and R_{83}.
B. Hum on PHONO and TAPE.	1. Defective shielded wire and/or wrong connection of record player, tape recorder or others.	Replace and connect correctly
	2. Audio system and shielded wire induced from outside.	Keep proper distance between audio system and inductor.
	3. Residual hum of audio system connected to the unit.	Replace or repair.
A. Noise on AUX and TUNER.	1. Fixed resistor badly connected or touched by another part.	Check R_{37}, R_{38}, R_{41}, R_{42}, R_{63}, R_{64}, R_{84}, R_{85}, R_{86}, R_{87}, R_{92}, R_{93}, R_{95}, and R_{96}.
	2. Capacitor nearly short-circuited or touched by another part.	Check C_{56}, C_{57}, C_{60}, C_{61}.
	3. Primary coil of output transformer nearly disconnected.	Check T_2 and T_3.
	4. Defective tube.	Check $V_1 \sim V_9$.
B. Noise on PHONO and TAPE.	1. Fixed resistor defective or nearly disconnected.	Check $R_7 \sim R_{32}$
	2. Defective capacitor.	Check $C_1 \sim C_{10}$
	3. Noise or bad connection of audio system connected to the unit.	Replace or repair

PARTS LIST

Part No.	Nomenclature
R_1	5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_2	5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_3	100KΩ ¼Watt ±10% Carbon Fixed Resistor
R_4	100KΩ ¼Watt ±10% Carbon Fixed Resistor
R_5	150KΩ ¼Watt ±10% Carbon Fixed Resistor
R_6	150KΩ ¼Watt ±10% Carbon Fixed Resistor
R_7	170KΩ ¼Watt ±10% Carbon Fixed Resistor
R_8	170KΩ ¼Watt ±10% Noise-Less Resistor
R_9	100KΩ ¼Watt ±10% Noise-Less Resistor
R_{10}	100KΩ ¼Watt ±10% Noise-Less Resistor
R_{11}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{12}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{13}	300Ω ¼Watt ±10% Carbon Fixed Resistor
R_{14}	300Ω ¼Watt ±10% Carbon Fixed Resistor
R_{15}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{16}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{17}	70KΩ ¼Watt ±10% Noise-Less Resistor
R_{18}	70KΩ ¼Watt ±10% Noise-Less Resistor
R_{19}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{20}	15KΩ ¼Watt ±10% Noise-Less Resistor
R_{21}	12KΩ ¼Watt ±10% Noise-Less Resistor
R_{22}	12KΩ ¼Watt ±10% Noise-Less Resistor
R_{23}	10Ω ¼Watt ±10% Carbon Fixed Resistor
R_{24}	10Ω ¼Watt ±10% Carbon Fixed Resistor
R_{25}	3KΩ ¼Watt ±10% Noise-Less Resistor
R_{26}	3KΩ ¼Watt ±10% Noise-Less Resistor
R_{27}	12KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{28}	12KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{29}	16KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{30}	16KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{31}	5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{32}	5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{33}	50KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{34}	50KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{35}	2.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{36}	2.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{37}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{38}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{39}	100KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{40}	100KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{41}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{42}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{43}	400KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{44}	400KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{45}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{46}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{47}	5MΩ ½Watt ±10% Carbon Fixed Resistor
R_{48}	5MΩ ½Watt ±10% Carbon Fixed Resistor
R_{49}	100KΩ Enclosed in CRSO2
R_{50}	100KΩ Enclosed in CRSO2
R_{51}	15KΩ Enclosed in CRSO2
R_{52}	15KΩ Enclosed in CRSO2
R_{53}	100KΩ Enclosed in CRSO2
R_{54}	100KΩ Enclosed in CRSO2
R_{55}	50KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{56}	50KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{57}	80KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{58}	80KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{59}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{60}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{61}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{62}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{63}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{64}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{65}	20KΩ 1 Watt ±10% Carbon Fixed Resistor
R_{66}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{67}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{68}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{69}	2MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{70}	1MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{71}	1MΩ ¼Watt ±10% Carbon Fixed Resistor
R_{72}	50KΩ Enclosed in CRSO1
R_{73}	50KΩ Enclosed in CRSO1
R_{74}	50KΩ Enclosed in CRSO1
R_{75}	50KΩ Enclosed in CRSO1
R_{76}	50KΩ Enclosed in CRSO1
R_{77}	50KΩ Enclosed in CRSO1
R_{78}	300Ω ¼Watt ±10% Carbon Fixed Resistor
R_{79}	300Ω ¼Watt ±10% Carbon Fixed Resistor
R_{80}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{81}	1.5KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{82}	2KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{83}	2KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{84}	600KΩ ½Watt ±10% Carbon Fixed Resistor
R_{85}	600KΩ ½Watt ±10% Carbon Fixed Resistor
R_{86}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{87}	150KΩ ½Watt ±10% Carbon Fixed Resistor
R_{88}	12KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{89}	12KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{90}	6KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{91}	6KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{92}	30KΩ ½Watt ±10% Carbon Fixed Resistor
R_{93}	30KΩ ½Watt ±10% Carbon Fixed Resistor
R_{94}	50KΩ 1 Watt ±10% Carbon Fixed Resistor
R_{95}	30KΩ ½Watt ±10% Carbon Fixed Resistor
R_{96}	30KΩ ½Watt ±10% Carbon Fixed Resistor
R_{97}	250KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{98}	250KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{99}	250KΩ ¼Watt ±10% Carbon Fixed Resistor
R_{100}	250KΩ ¼Watt ±10% Carbon Fixed Resistor

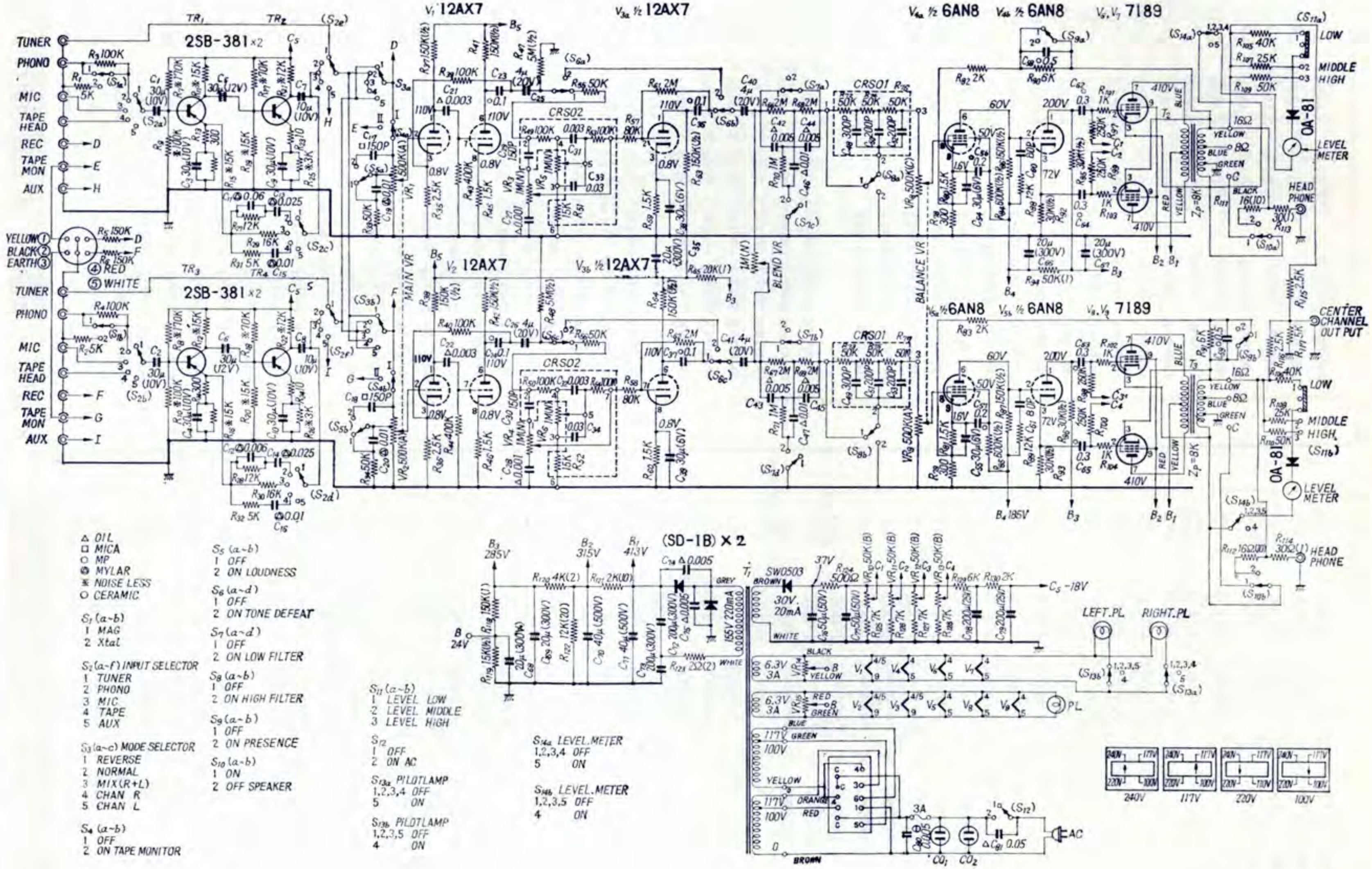
Part No.	Nomenclature				
R101	1KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R102	1KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R103	1KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R104	1KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R105	40KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R106	40KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R107	25KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R108	25KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R109	50KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R110	50KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R111	16Ω	10Watt	±10%	Wire Wound	Resistor
R112	16Ω	10Watt	±10%	Wire Wound	Resistor
R113	30Ω	1 Watt	±10%	Carbon Fixed	Resistor
R114	30Ω	1 Watt	±10%	Carbon Fixed	Resistor
R115	2.5KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R116	2.5KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R117	5KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R118	150KΩ	1 Watt	±10%	Carbon Fixed	Resistor
R119	15KΩ	½Watt	±10%	Carbon Fixed	Resistor
R120	4KΩ	2 Watt	±10%	Carbon Fixed	Resistor
R121	2KΩ	10Watt	±10%	Wire Wound	Resistor
R122	12KΩ	20Watt	±10%	Wire Wound	Resistor
R123	2kΩ	¼Watt	±10%	Carbon Fixed	Resistor
R124	500Ω	¼Watt	±10%	Carbon Fixed	Resistor
R125	7KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R126	7KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R127	7KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R128	7KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R129	6KΩ	¼Watt	±10%	Carbon Fixed	Resistor
R130	2KΩ	¼Watt	±10%	Carbon Fixed	Resistor
C1	30μF	10WV		Electrolytic	tubular
C2	30μF	10WV		Electrolytic	tubular
C3	30μF	10WV		Electrolytic	tubular
C4	30μF	10WV		Electrolytic	tubular
C5	30μF	12WV		Electrolytic	tubular
C6	30μF	12WV		Electrolytic	tubular
C7	10μF	10WV		Electrolytic	tubular
C8	10μF	10WV		Electrolytic	tubular
C9	30μF	10WV		Electrolytic	tubular
C10	30μF	10WV		Electrolytic	tubular
C11	0.06μF	50WV	±10%	mylar	tubular
C12	0.06μF	50WV	±10%	mylar	tubular
C13	0.025μF	50WV	±10%	mylar	tubular
C14	0.025μF	50WV	±10%	mylar	tubular
C15	0.01μF	50WV	±10%	mylar	tubular
C16	0.01μF	50WV	±10%	mylar	tubular
C17	150pF	500WV	±10%	mica	tubular
C18	150pF	500WV	±10%	mica	tubular
C19	0.01μF	50WV	±10%	mylar	tubular

Part No.	Nomenclature				
C20	0.01μF	50WV	±10%	mylar	tubular
C21	0.003μF	400WV	±10%	oil	tubular
C22	0.003μF	400WV	±10%	oil	tubular
C23	0.1μF	250WV	±10%	MP	tubular
C24	0.1μF	250WV	±10%	MP	tubular
C25	4μF	20WV		Electrolytic	tubular
C26	4μF	20WV		Electrolytic	tubular
C27	0.001μF	400WV	±10%	oil	tubular
C28	0.001μF	400WV	±10%	oil	tubular
C29	150pF	Enclosed	in	CRSO2	
C30	150pF	Enclosed	in	CRSO2	
C31	0.003μF	Enclosed	in	CRSO2	
C32	0.003μF	Enclosed	in	CRSO2	
C33	0.03μF	Enclosed	in	CRSO2	
C34	0.03μF	Enclosed	in	CRSO2	
C35	20μF	300WV		Electrolytic	tubular
C36	0.1μF	250WV		MP	tubular
C37	0.1μF	250WV		MP	tubular
C38	30μF	6WV		Electrolytic	tubular
C39	30μF	6WV		Electrolytic	tubular
C40	4μF	20WV		Electrolytic	tubular
C41	4μF	20WV		Electrolytic	tubular
C42	0.005μF	400WV		oil	tubular
C43	0.005μF	400WV		oil	tubular
C44	0.005μF	400WV		oil	tubular
C45	0.005μF	400WV		oil	tubular
C46	0.01μF	400WV	±10%	oil	tubular
C47	0.01μF	400WV	±10%	oil	tubular
C48	300pF	Enclosed	in	CRSO1	
C49	300pF	Enclosed	in	CRSO1	
C50	200pF	Enclosed	in	CRSO1	
C51	200pF	Enclosed	in	CRSO1	
C52	200pF	Enclosed	in	CRSO1	
C53	200pF	Enclosed	in	CRSO1	
C54	30μF	6WV		Electrolytic	tubular
C55	30μF	6WV		Electrolytic	tubular
C56	0.2μF	250WV	±10%	MP	tubular
C57	0.2μF	250WV	±10%	MP	tubular
C58	0.5μF	250WV	±10%	MP	tubular
C59	0.5μF	250WV	±10%	MP	tubular
C60	80pF	500WV	±10%	mica	tubular
C61	80pF	500WV	±10%	mica	tubular
C62	0.3μF	250WV	±10%	MP	tubular
C63	0.3μF	250WV	±10%	MP	tubular
C64	0.3μF	250WV	±10%	MP	tubular
C65	0.3μF	250WV	±10%	MP	tubular
C66	20μF	300WV	Electrolytic	lug	terminal
C67	20μF	300WV	Electrolytic	lug	terminal
C68	20μF	300WV	Electrolytic	lug	terminal
C69	20μF	300WV	Electrolytic	lug	terminal

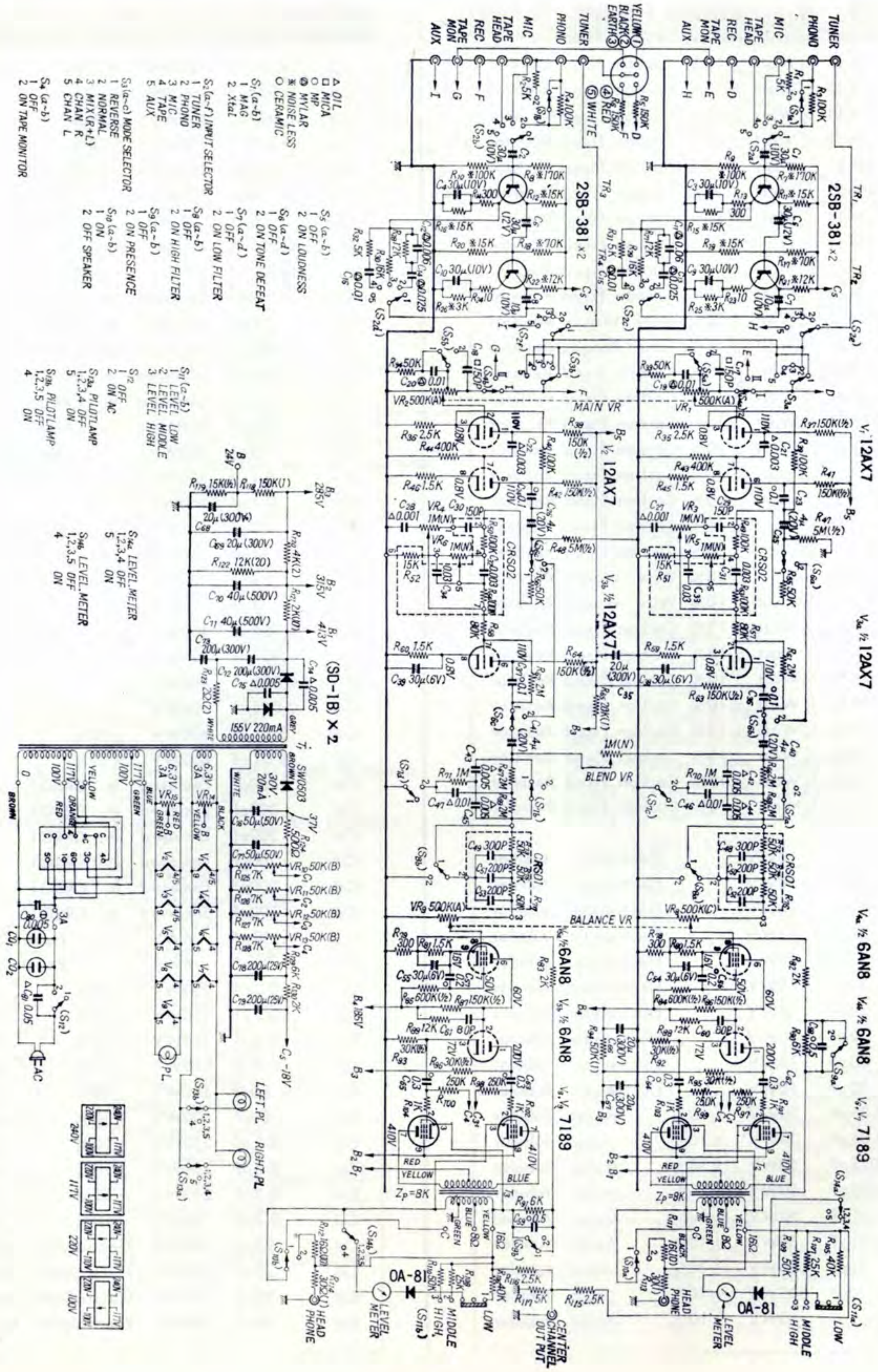
Part No.	Nomenclature				
C70	40μF	500WV	Electrolytic	lug	terminal
C71	40μF	500WV	Electrolytic	lug	terminal
C72	200μF	300WV	Electrolytic	lug	terminal
C73	200μF	300WV	Electrolytic	lug	terminal
C74	0.005μF	600WV	±10%	oil	tubular
C75	0.005μF	600WV	±10%	oil	tubular
C76	50μF	50WV		Electrolytic	tubular
C77	50μF	25WV		Electralytic	tubular
C78	200μF	25WV		Electrolytic	tubular
C79	200μF	25WV		Electrolytic	tubular
C80	0.005μF	500WV	$^{+100}_{-0}$%	Ceramic	tubular
C81	0.05μF	400WV	±10%	oil	tubular

Part No.	Nomenclature
VR1 VR2	500KΩ (A) Variable Resistor 24φ type Loudness tap 120KΩ (Volume control)
VR3~VR6	1MΩ (N) Variable Resistor 24φ type (Tone control)
VR7 VR8	500KΩ (A.C) Variable Resistor 24φ type (Balance control)
VR10~13	50KΩ (B) Variable Resistor driver type
VR14 VR15	100Ω Hum Balancer driver type
V1~V3b	12AX7 Pre amplifier
V4a~V5b	6AN8 Phase splitter
V6~V9	7189A Power amplifier
TR1~TR4	Transistor 2SB-381 Head amplifier
T1	Power transformer
T2, T3	Output transformer
SD-1B	Si diode AC (RMS) 280V ID 500mA −60°C~+100°C
SW-0503	Si diode AC (RMS) 90V ID 500mA −55°C~+100°C
S1(a~b)	Cartridge switch
S2(a~f)	Input Selector switch
S3(a~c)	Mode switch
S4(a~b)	Tape monitor switch
S5(a~b)	Loudness switch
S6(a~d)	Tone defeat switch
S7(a~d)	Low filter switch
S8(a~b)	High filter switch
S9(a~b)	Presence switch
S10(a~b)	Speaker switch
S11(a~b)	Level meter control switch
S12	Power switch
S13a, 13b	Level meter pilot lamp switch
S14a, 14b	Level meter switch
CO1~2	AC outlet
OA-91	Ge. diode VD=90V ID=25mA −55°~75°C

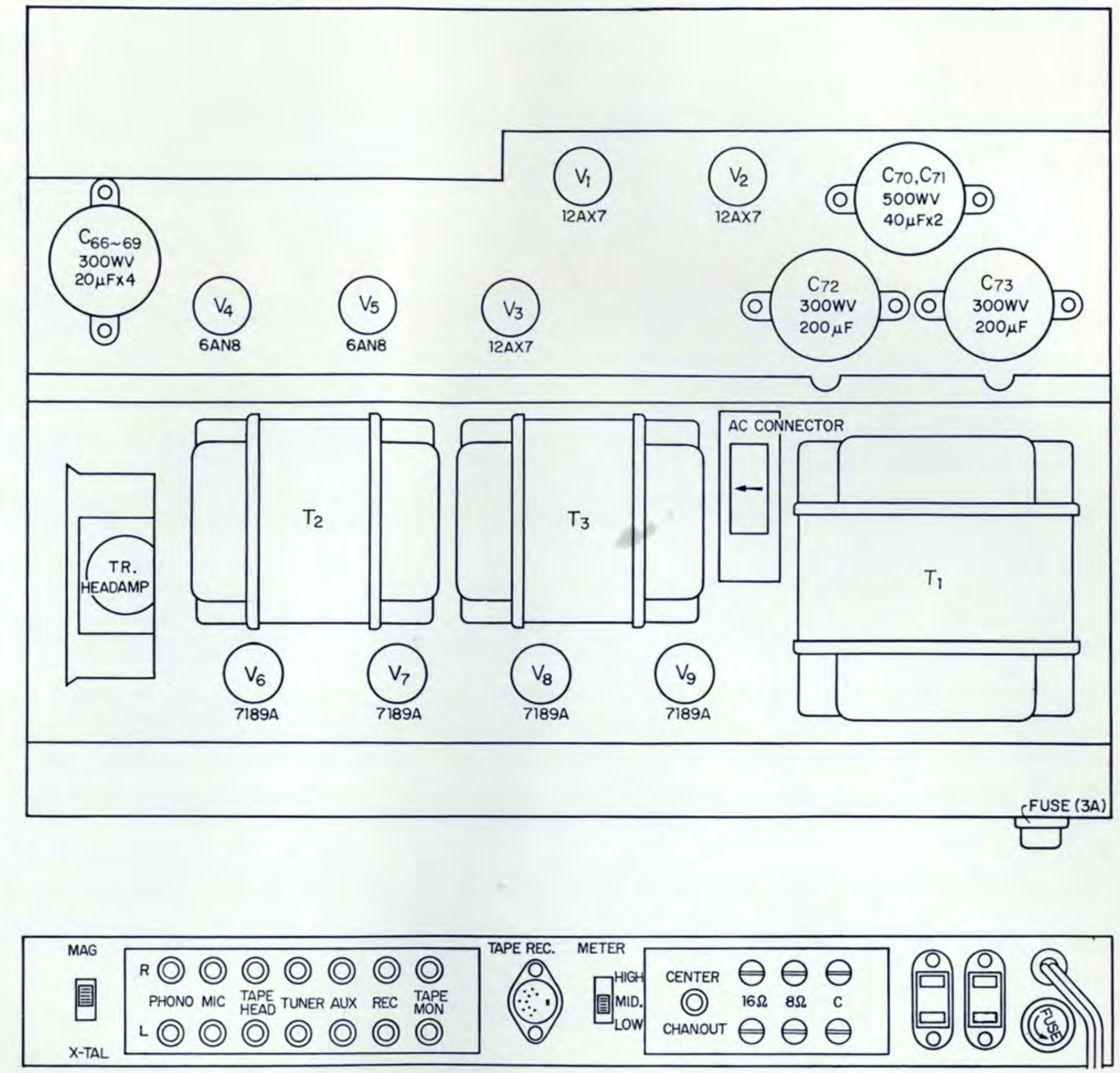
SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



PARTS LAYOUT



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Printed in Japan (O1200M6)